IN THE CLAIMS

This listing of the claim will replace all prior versions and listings of claim in the present application.

Listing of Claims

1.   (currently amended): A cache control method in a computer system that includes a storage device having a plurality of physical devices for storing data, at least one client, and a relay device, the cache control method comprising:

relaying, by said relay device, data between said storage device and each of said at least one client,

wherein said relay device includes a cache disk module for caching processed data being relayed between said storage device and said at least one client;

relating data processed in the computer system with attribute data which configures a caching operation of the cache disk module that caches the processed data on a primary network which connects each of said at least one client and said relay device to each other; and

mediating the processed data between the storage device and each of the at least one client via a secondary network, which connects said relay device and said storage device to each other, without the caching operation of the cache disk module when the attribute data prohibits the caching operation,

wherein a plurality of virtual volumes are formed on said physical devices, and each of said at least one client is assigned to at least one of said virtual volumes, thereby permitting said each of said at least one client to

access data stored in said at least one of said virtual volumes to which it is
assigned,

wherein said attribute data is ~~held~~ stored in a cache attribute
management table which stores a plurality of entries, each of which sets a
corresponding relation between identification information identifying one of
said virtual volumes, identification information identifying ~~one~~ at least two of
said physical devices forming a part of said one of said virtual volumes, and
said attribute data, which provides an indication whether data stored in said
one of said physical devices is cacheable or not, ~~and~~

wherein said attribute data corresponding to each of said at least two of
said physical devices may differ from one another,

wherein ~~said~~ each entry of said cache attribute management table
further sets a corresponding relation between an indication as to whether data
to be read from ~~a physical device~~ each of said at least two of said physical
devices forming part of said one of said virtual volumes is cacheable or not
and an indication as to whether data to be written to each of said at least two
of said physical device forming part of said one of said virtual volumes is
cacheable or not, and

wherein when one physical device of said at least two of said physical
devices is shared by a first virtual volume and a second virtual volume, said
attribute data corresponding to said first virtual volume indicates that data
stored in said one physical device is cacheable, and said attribute data
corresponding to said second virtual volume indicates that data stored in said
one physical device is not cacheable.

2.   (previously presented): The cache control method according to claim 1, further comprising encrypting the processed data cached in the cache disk module.

3.   (currently amended): A relay device comprising:

a cache disk module for caching data being relayed between a storage device having a plurality of physical devices for storing data, and at least one client,

wherein said relay device relays data between said storage device and each of said at least one client;

an obtaining unit that obtains attribute data related with data processed by the at least one client, wherein the attribute data configures a caching operation of the cache disk module that caches the processed data on a primary network which connects each of said at least one client and said relay device to each other; and

a mediating unit that mediates the processed data between the storage device and each of the at least one client via a secondary network, which connects said relay device and said storage device to each other, without the caching operation of the cache disk module when the attribute data prohibits the caching operation,

wherein a plurality of virtual volumes are formed on said physical devices, and each of said at least one client is assigned at least one of said virtual volumes, thereby permitting said each of said at least one client to

access data stored in said at least one of said virtual volumes to which it is
assigned,

wherein said attribute data is ~~held~~ stored in a cache attribute
management table which stores a plurality of entries, each of which sets a
corresponding relation between identification information identifying one of
said virtual volumes, identification information identifying ~~one~~ at least two of
said physical devices forming a part of said one of said virtual volumes, and
said attribute data, which provides an indication whether data stored in said
one of said physical devices is cacheable or not, ~~and~~

wherein said attribute data corresponding to each of said at least two of
said physical devices may differ from one another,

wherein ~~said~~ each entry of said cache attribute management table
further sets a corresponding relation between an indication as to whether data
to be read from ~~a physical device~~ each of said at least two of said physical
devices forming part of said one of said virtual volumes is cacheable or not
and an indication as to whether data to be written to each of said at least two
of said physical device forming part of said one of said virtual volumes is
cacheable or not, and

wherein when one physical device of said at least two of said physical
devices is shared by a first virtual volume and a second virtual volume, said
attribute data corresponding to said first virtual volume indicates that data
stored in said one physical device is cacheable, and said attribute data
corresponding to said second virtual volume indicates that data stored in said
one physical device is not cacheable.

4.   (previously presented): The relay device according to claim 3, further comprising:

a volatile memory for the caching, wherein the mediation unit mediates the processed data between the storage device and the at least one client via the secondary network, by primarily using the volatile memory and secondarily using the cache disk module.

5.   (previously presented): The relay device according to claim 4, further comprising:

an encryption unit that encrypts the data cached in the cache disk module of the relay device.

6.   (previously presented): The relay device according to claim 5, further comprising:

an encryption obtaining unit that obtains encryption attribute data related with the processed data, wherein the encryption attribute data configures an encrypting operation that encrypts the data cached in the cache disk module; and

an encryption unit that encrypts the data cached in the cache disk module when the encryption attribute data requires the encrypting operation.

7.   (previously presented): The relay device according to claim 5, further comprising:

a volatile memory for storing key data used for generating the encrypted data.

8.   (previously presented): The relay device according to claim 3, wherein the attribute data is included in the processed data, and the obtaining unit obtains the attribute data from the processed data.

9.   (previously presented): The relay device according to claim 3, wherein the attribute data is associated with a data storage block of the storage device for storing the processed data, and the obtaining unit obtains the associated attribute data from the storage device via the network in advance of mediation by the mediation unit.

10.   (previously presented): The relay device according to claim 3, wherein the attribute data is included in error data that notifies an occurrence of an error in the at least one client, and the obtaining unit obtains the attribute data from the error data, and

wherein switching between caching and not caching of the processed data is conducted when error data is received.

11.   (currently amended): A storage device that is connected to at least one client and a relay device, the storage device comprising:

a plurality of physical devices upon which are formed a plurality of virtual volumes for storing data processed by the at least one client,

wherein said relay device relays data between said storage device and each of the at least one client,

wherein said relay device includes a cache disk module for caching processed data being relayed between said storage device and said at least one client,

wherein the processed data is mediated between the at least one client and the storage device via a secondary network, which connects said relay device and said storage device to each other, and

wherein each of said at least one client is assigned to at least one of said virtual volumes, thereby permitting each of said at least one client to access data stored in said at least one of said virtual volumes to which it is assigned;

a relation unit that relates the processed data with attribute data which configures a caching operation of the cache disk module that caches the processed data on a primary network which connects each of said at least one client and said relay device to each other; and

a notification unit that notifies the relay device of the attribute data related with the processed data,

wherein said attribute data is ~~held~~ stored in a cache attribute management table which stores a plurality of entries, each of which sets a corresponding relation between identification information identifying one of said virtual volumes, identification information identifying ~~one~~ at least two of said physical devices forming a part of said one of said virtual volumes, and said attribute data, which provides an indication whether data stored in said one of said physical devices is cacheable or not, ~~and~~

wherein said attribute data corresponding to each of said at least two of said physical devices may differ from one another,

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wherein ~~said~~ each entry of said cache attribute management table further sets a corresponding relation between an indication as to whether data to be read from ~~a physical device~~ each of said at least two of said physical devices forming part of said one of said virtual volumes is cacheable or not and an indication as to whether data to be written to each of said at least two of said physical device forming part of said one of said virtual volumes is cacheable or not, and

wherein when one physical device of said at least two of said physical devices is shared by a first virtual volume and a second virtual volume, said attribute data corresponding to said first virtual volume indicates that data stored in said one physical device is cacheable, and said attribute data corresponding to said second virtual volume indicates that data stored in said one physical device is not cacheable.

12.   (previously presented): The storage device according to claim 11, wherein the relation unit comprises:

an additional module that adds the attribute data to the processed data, and the added attribute data is mediated together with the processed data.

13.   (previously presented): The storage device according to claim 11, wherein the attribute data is associated with a data storage block of the storage device, and the notification unit notifies the relay device of the associated attribute data in advance of mediation of the processed data.

14.   (previously presented): The storage device according to claim

11, wherein the storage device further comprises:

a key data management unit that manages key data used for

encrypting the data cached in the cache disk module of said relay device; and

a key notification module that notifies the relay device of the managed

key data.

15-18. (canceled).

19.   (currently amended): A computer readable recording medium in

which a computer program is recorded, the computer program causing a

computer to control operations of a relay device, the computer program when

executed causes the relay device to perform the functions of:

relaying data between a storage device and each of at least one client,

wherein said relay device includes a cache disk module for caching

data being relayed between the storage device having a plurality of physical

devices for storing data, and the at least one client;

obtaining attribute data related with data processed by the at least one

client,

wherein the attribute data configures, a caching operation of the cache

disk module that caches the processed data on a primary network which

connects each of said at least one client and said relay device to each other;

and

mediating the processed data between the storage device and each of

the at least one client via a secondary network, which connects said relay

device and said storage device to each other, without the caching operation of

the cache disk module when the attribute data prohibits the caching operation,

wherein a plurality of virtual volumes are formed on said physical

devices, and each of said at least one client is assigned at least one of said

virtual volumes, thereby permitting said each of said at least one client to

access data stored in said at least one of said virtual volumes to which it is

assigned,

wherein said attribute data is held stored in a cache attribute

management table which stores a plurality of entries, each of which sets a

corresponding relation between identification information identifying one of

said virtual volumes, identification information identifying one at least two of

said physical devices forming a part of said one of said virtual volumes, and

said attribute data, which provides an indication whether data stored in said

one of said physical devices is cacheable or not, and

wherein said attribute data corresponding to each of said at least two of

said physical devices may differ from one another,

wherein said each entry of said cache attribute management table

further sets a corresponding relation between an indication as to whether data

to be read from a physical device each of said at least two of said physical

devices forming part of said one of said virtual volumes is cacheable or not

and an indication as to whether data to be written to each of said at least two

of said physical device forming part of said one of said virtual volumes is

cacheable or not, and

wherein when one physical device of said at least two of said physical

devices is shared by a first virtual volume and a second virtual volume, said

attribute data corresponding to said first virtual volume indicates that data

stored in said one physical device is cacheable, and said attribute data

corresponding to said second virtual volume indicates that data stored in said

one physical device is not cacheable.

     20.   (previously presented): The cache control method according to

claim 1, wherein said primary network and said secondary network are

different from each other.